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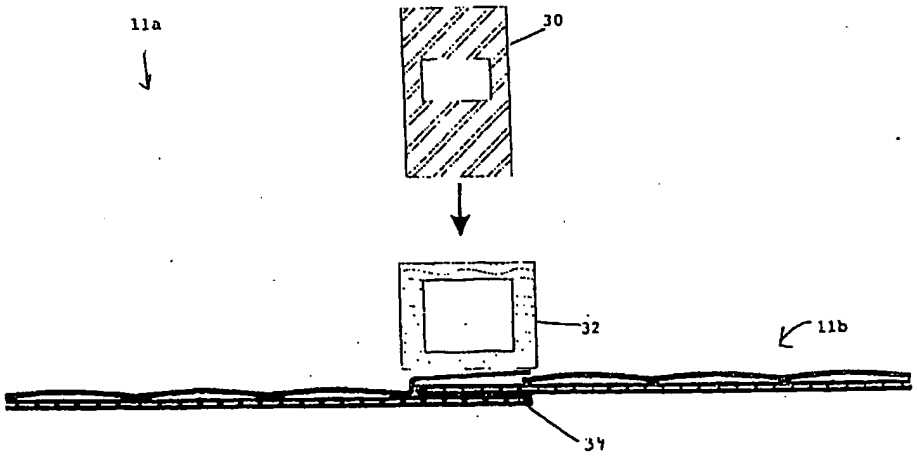

(57) Abstract

A flexible outdoor sign (10) being comprised of a flexible substrate layer (18) and a flexible reflective layer (16), wherein the sign (10) is of a grand format dimension, that is, greater than 48 inches wide, and further being most applicable to outdoor billboards, truck curtains, and other large outdoor venues. Due to its flexible nature, this sign (10) can be rolled up and transported easily, as it does not depend on heavy plywood backing to support it. Upon being delivered, the sign (10) can be unrolled and winched around a billboard, for example. The sign (10) is then anchored with trucking straps, or the like. This invention is also a flexible sign material made into grand format dimensions, as well as a method for making this material.

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FLEXIBLE GRAND FORMAT REFLECTIVE SIGN AND MATERIALS AND METHODS FOR MAKING

1. Cross Reference to Related Applications

This application claims the benefit of U.S. Provisional Application No. 60/098,982, filed September 2, 1998.

2. Field of the Invention

This invention pertains generally to outdoor signs and billboards used for advertising purposes, and, more specifically, to a flexible grand format reflective sign and methods and materials for making a flexible grand format reflective sign.

3. Background

Billboards have been a common vehicle for advertising goods and services outdoors for over seventy years. Billboards convey a message relating to a product or service to captive audiences in automobiles and to casual passerbys. In the early days of billboard manufacture, a paper sign was glued to a plywood backing, or other rigid substrate, and assembled piecemeal to comprise an entire advertisement. These early paper billboards were designed for temporary use, as they usually deteriorated in the environment in less than three months time. If a more permanent board was desired, this involved hand-painting a billboard advertisement directly onto the plywood, in which case such a sign could last for several years.

Early billboards were limited to daylight use, only, because old-time painted boards could not be seen at night. When electric lighting became commonplace in large cities, billboards began incorporating lighting systems for night use. However, in the outlying areas where electricity was non-existent, or too expensive

to run electrical lines, boards placed in such areas were still limited to daytime use, only. As a result, the advertising ability of these outlying billboards effectively shut down at dusk.

A solution to lighting boards inaccessible to electricity came with the advent of reflective materials. These reflective materials made it possible to use the headlights of oncoming automobiles to serve as a light source for illuminating reflective signs.

These reflective materials are rated according to a "candlepower" standard measured in candelas per lux per square meter (cpl.). A synopsis of various reflective materials presently known for use with signage, and their cpl. rating follows:

Enclosed Lens Vinyl - 90 cpl. - This reflective material is commonly used for commercial signs, vehicle graphics, and safety markings. This material is made from glass spheres (lenses) enclosed (embedded) in polyvinyl chloride compounds. The material is constructed to become one layer of film and adhesive, and as such can be cut into graphical shapes and letters. The surface is screen printable, paintable, and digitally printable, and the product commonly has an adhesive backing to affix to rigid sheeting such as plywood or aluminum. This type of product cannot withstand folding or creasing without damaging the light reflecting properties. Enclosed lens films are angularly restricted in that they have a narrow entrance and observation angle, requiring almost a straight-on approach of a light source and viewer to reflect light and be seen. They are further limited by a reduction in reflective capacity due to the lenses being embedded into the vinyl structural layer. Enclosed lens billboards must be placed within approximately 15 feet of the edge of a roadway, or else they will not adequately reflect light. Typical billboard signs are manufactured with enclosed lens material by adhering the material to a plywood substrate,

or backing.

Encapsulated Lens Film - 250cpl. - This material is manufactured by encapsulating glass spheres under hermetically sealed "cells" that maintain an airspace to allow the lenses to reflect at full capacity. Sealing the lenses protects them from the elements, as the lenses will not reflect if they become dirty or wet. Encapsulated Lens Film is often used on street signs, and has a silver base color derived from a mirror coating under the lenses. The silver color is acceptable for street sign uses, but imparts an undesirable 10% to 15% shift in colors that is undesirable for billboard art. Current digital technology cannot print directly to encapsulated lens films, as they have an acrylic or polycarbonate layer that overlays the encapsulation layer. The same layer creates a rigid yet fragile structure that requires the material be adhered onto a supportive substrate like plywood or aluminum. Encapsulated Lens Films offer higher c.p.l. ratings when compared to enclosed lens films, and offer broader entrance and observation angles. This film is occasionally used to make billboards by cutting out the film in the form of graphic elements , and applying them as individual pieces to eventually comprise an entire sign.

Rigid formed sheet - This film is manufactured by forming a sheet of acrylic or similar material to have a layer of micro prisms under one surface of an optically clear material, or bonding hard prisms onto rigid sheeting. 3M Diamond Grade film is typical of this type of formed sheet, and uses hermetically sealed chambers in small sized (.25"+-) diamonds that are backed by a layer of vinyl and adhesive. This film is stiff, rigid, and not printable by current digital means. This film requires a substrate like plywood or aluminum to be displayed in an outdoor environment.

Flexible Bonded Sheet - is manufactured by bonding semi-hard micro prisms onto flexible support substrate layer such as polyvinyl chloride combined with nylon web or polyester. Flexible Bonded Sheet constructions are relatively new materials which have gained considerable acceptance in flexible street sign, apparel, and sporting goods manufacture. For apparel, the material is typically sewn into a garment to create a semi-sealed cell. For signage, the sealed cellular (air pocket) construction is used, with the support substrate typically the desired color of the sign in its finished use, i.e. orange, yellow, red, white. These materials are digitally printable. This material can be viewed at direct and indirect viewing angles. This material offers bright reflected and ambient whites and reflecting power which works in the daylight as well as the night. Graphically, it is ideally suited for flexible reflective billboards. However, this material suffers from the following four drawbacks for billboard uses, namely: 1) that it is not manufactured in widths greater than 48" and; 2) it could not be readily converted into larger widths, and; 3) to create larger widths with stock items, an adhesive layer (and subsequent silver color) would be required and; 4) hand application of the adhesive coated sheeting would be required to affix it to a standard billboard vinyl face. Additionally, present manufacturers recommend that this material be affixed only to rigid materials, such as plywood, thereby increasing transportation costs related to shipping a sign to its point of use.

Prismatic Films - 300-900cpl. -Prismatic (or cube corner micro prism (CCMR)) films offer the high reflectance and widest entrance and observation angles. Since all of the prismatic layers are clear by design, they offer no opaque reflectance to make a white colored background in daylight, and they offer minimal structural integrity for exterior function. This material requires a support layer for structural integrity and graphical

appearance for the desired end use. To be serviceable, this material requires maintaining the mirror surface of the prisms as light reflective facets. This can be accomplished by mirroring the prisms on the film by depositing some from of silvering to create a mirror finish, or by creating a sealed chamber under the prisms to allow the prisms to reflect with their natural polish. In the mirrored construction, adhesives can be applied to the back of the prismatic film, as the mirror coating acts to reflect light, and the reflective properties are not diminished. The silvering or mirroring deposition is grey (about 30%) and appears similar to stainless steel. This material is manufactured by manufacturers which include Reflexite Corp, Stimsonite Corp, and 3M Corp, and is comprised of a flexible reflective material which can be manufactured with an adhesive coating for hand-pressure applications. Because CCMR can be digitally printed upon it makes an excellent choice for grand format signs such as billboards and truck curtains.

CCMR and flexible bond sheet are flexible, unlike the more rigid flexible materials previously described. Smaller signs under 48" square, using flexible bonded sheet have been created, which can then be rolled up and easily transported. So far, no one has devised any materials and methods by which a flexible grand format reflective sign could be created for such applications on billboards and truck curtains.

The foregoing discussion reflects the state of the art of which the inventor is aware, and is tendered with a view toward discharging the inventor's acknowledged duty of candor in disclosing information which may be pertinent with regards to the patentability of the present invention. It is respectfully stipulated, however, that the disclosed information does not teach or render obvious, singly or when considered in combination, the inventor's claimed invention.

SUMMARY OF THE INVENTION

In its broadest sense, this invention applies to any flexible grand format reflective sign comprised of a flexible reflective layer bonded to a flexible structural substrate layer. This invention relates to creating flexible grand format reflective signs by two methods: 1) Hand applying flexible reflective sign material to a flexible substrate by adhesive means; and 2) modifying sections of flexible bonded sheet for purposes of adjoining sections to create a grand format sign. This invention further relates to a material comprised of a modified flexible bonded sheet which can be used to create grand format signs. Finally, this invention relates to grand format signs produced by the two methods described herein. Consequently, the following objects and advantages are to be achieved by this invention:

It is an object of this invention to provide a modification to existing flexible bonded sheet sign materials and use them to create grand format reflective signs; this modification being designed to effect easy and complete adjoining of said sign materials by machine manufacture so that 100% reflective quality and 100% structural integrity is maintained across the surface of a sign.

It is an object of this invention to provide a reflective sign in a grand format size which uses a lightweight substrate material and which can be rolled up and shipped to an installation location with minimal shipping cost.

It is still a further object of this invention to provide a reflective sign in a grand format size which can be unrolled and installed on a billboard frame or other hanging surface, using straps or poles, and four, or less, laborers.

Further objects and advantages of the invention will be brought out in the following portions of the specification, wherein the detailed description is for the purpose of fully disclosing preferred embodiments of the invention without placing limitations thereon.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be more fully understood by reference to the following drawings which are for illustrative purposes only:

FIG. 1 is an exploded perspective view of a grand format sign wherein adhesive CCMR is used in a hand application method.

FIG. 2 is an end cutaway view of a section of flexible bonded sheet material.

FIG. 3 is an end cutaway view of a section of flexible bonded sheet material prepared in accordance with the preferred method of making a grand format sign as described herein.

FIG. 4 is an end cutaway view of adjacent sections of flexible bonded sheet material, prepared in accordance with the method described herein, positioned for RF welding.

FIG. 5 is an end cutaway view showing the substrate layers of adjacent sections of flexible bonded sheet being RF "bar welded" with a sealing bar, in accordance with the method described herein.

FIG. 6 is an end cutaway view showing the substrate layers of adjacent sections following RF bar welding.

FIG. 7 is an end cutaway view showing a pattern replicating die welding the reflective layer over the previously welded substrate layers of adjacent flexible bonded sheet sections, as a final step to the process described herein.

FIG. 8 is an end cutaway view showing a completed joint coupling two adjacent flexible bonded sheet sections.

FIG. 9 is a perspective bottom view of a throw-away pattern replicating die for use in practicing the method described herein.

FIG. 10 is a bottom view of a permanent pattern replicating die for use in practicing the method described herein.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention relates to flexible grand format reflective signs and materials and methods for making said signs.

Cube Corner Microprism Retroreflective Film (CCMR) has the following superior qualities: 1) It can be digitally printed; 2) It can be bonded to a lightweight flexible substrate such as PVC/nylon web; 3) It is flexible, and therefore compares in flexibility to substrates, such as PVC/nylon, thereby reducing problems associated with delamination; 4) It can be viewed from direct and indirect viewing angles.

However, no grand format signs ("grand format" meaning signs wider than 48") using CCMR have been produced. In the first embodiment of this invention, a method for hand-applying adhesive-backed CCMR to a PVC/nylon web substrate to create a grand format size sign, such as a 10' X 48' (480 square feet) billboard, is described. This type of grand format sign 10 produced in accordance with this method is shown in FIG. 1. This method requires that CCMR sections 12 be hand-applied to a vinyl (PVC) and nylon web substrate 18 having the appropriate 10' X 48' dimension of a typical billboard. A flexible substrate 18, such as vinyl and nylon web, of a grand format scale, is made by radio frequency (RF) bar welding adjacent sections 14 of substrate material 18 together until a grand format dimension, such as 10' X 48' is achieved. Next, the adhesive-backed CCMR must be printed in sections 12, with the appropriate advertisement and background. Digital printing is one known method for applying words, logos, and photographs and other indicia 15 to sections of CCMR. The respective adhesive sections 12 are next aligned precisely, and hand-applied to the substrate 18. Two skilled laborers require about 4 hours to produce a single 480 square foot grand format sign using this hand application method. While a presentable sign 10 is produced with this method, which can be rolled up and transported, this method is slow and labor intensive; also air bubbles can occur under the CCMR, or else improper adhesion occurs in spots, thereby affecting the uniform visual quality of the finished

sign product

As an alternative to the hand application of CCMR material in grand format size signs, flexible bonded sheet material is used in accordance with a second method of producing a grand format sign as described herein. In the prior art, small signs having a maximum width of 48" have been created using flexible bonded sheet material. This material typically comes in rolls which are up to 48 inches wide, maximum, but which have a variable length, sometimes as long as 5000 yards. This 48" wide material is machine manufactured using an RF computer indexed welder and patterned die. The die pattern is a series of depressed square air pillows of approximately 1 inch square. Where there are depressions in the die, no contact, and therefore, no weld occurs. At the edges of each square, the die makes contact and welds the reflective layer to the flexible vinyl and nylon web substrate. The result is a sign material having a plurality of barely visible square air pillows across its surface and having a width up to 48 inches. It has been found that due to the flexible nature of the reflective layer, and the flexible nature of the substrate layer, that precise machine registration is difficult at widths above 48 inches, and therefore, this width limit is presently the state of the art for this material. Presently, development of a machine to produce pre-bonded sign material in widths greater than 48 inches has not been completed.

The present invention is a sign material comprised of modifying flexible bonded sheet in a manner so that adjacent sheet sections can be readily welded together into a grand format dimension. This material, can then be used a grand format blank (without indicia) which can be shipped to a sign maker for printing indicia and creating a finished grand format sign. This material and the process for using it to make a flexible grand format sign maintains 100% uniform structural integrity and 100% uniform visual appearance across the entire surface of a grand format sign. While the hand application method using CCMR, described previously, creates a presentable flexible grand format sign, the level of visual appearance is superior with the second method described herein, which uses

flexible bonded sheet material. For purposes of this invention, the term "flexible" means the ability of a sign made from the materials and methods described herein to be rolled up for shipping, without damage or delamination of different layers, and subsequently unrolled, for installation. Although CCMR and flexible bonded sheet are discussed herein as two reflective materials capable of meeting this definition of flexibility, any other reflective material which meets this definition is also hereby included within the scope of the invention.

In a representative embodiment, flexible bonded sheet of the type already described herein is used to produce a sign material in accordance with the present invention. Flexible bonded sheet provides near matching flexibilities with the web substrate layer such that the final sign product can be rolled, and unrolled, without problems associated with delamination. Additionally, the flexible nature of the two layers allows the sign to be produced in grand format sizes, and subsequently rolled up and shipped to any location for installation. A grand format sign manufactured from web substrate and flexible bonded sheet, in a standard billboard size of 10' X 48', weighs about 120 pounds, which is one-tenth the typical weight of a 3M Diamond Grade sign of similar size which weighs about 1200 pounds, due to its dependence on a plywood substrate. Hence, a significant savings is provided by the present invention in terms of shipping costs.

Flexible bonded sheet material includes a flexible reflective layer bonded to a flexible substrate layer such as vinyl and nylon web, using an RF weld process and a computer index welder having a die which forms a plurality of 1 inch square air pillows across the surface of the flexible bonded sheet. These air pillows provide air space between the reflective material and the substrate layer for purposes of maintaining reflective qualities. These air spaces must be maintained in the flexible bonded sheet to retain its reflective properties and to retain its ability to be viewed at indirect angles.

FIG. 2 represents a cutaway end view of a section of standard flexible bonded sheet which is unmodified in any way. Here the flexible bonded sheet 11,

has a reflective layer 16, a substrate layer 18, and associated air pillows 20 and air pockets 22. FIG. 3 represents a section of flexible bonded sheet 11 modified in a manner to represent the sign material which is the present invention. In FIG. 3, a first end 24 and a second end 26 of the material section have been prepared so that first end 24 is comprised of a substrate layer 18 only, devoid of any reflective layer 16 and second end 26 retains a reflective layer in the form of a loose end flap 28. Ends 24 and 26 have been prepared in this manner so as to be amenable to joining adjacent sections of sign material for purposes of manufacturing a complete grand format sign 10.

FIG. 4 illustrates adjacent sections 11a, 11b of flexible bonded sheet being joined by underlapping first end 24 beneath end flap 28 of second end 26. FIG. 5 illustrates a sealing bar 30 of an RF welder joining the respective substrate layers 18 of the adjacent material sections 11a, 11b. FIG. 6 illustrates the joined substrate layers 18 after welding and prior to joining end flap 28. FIG. 7 illustrates the final step of the process which involves coupling a pattern replicating die 32 which replicates the air pillows along the weld seam 34. This final step is accomplished by RF welding and creates an uninterrupted air pillow surface across the grand format sign material, thereby preserving 100% visual appearance and 100% uniformity across the surface of the grand format sign material. When the sign material is digitally printed upon, the indicia printed on the finished sign appear clear and uninterrupted. This final step provides a sign material which has a width greater than the 48 inch limitation of standard flexible bonded sheet; that is the edge perpendicular to the weld seams in the finished material is wider than 48 inches, making grand format sizes possible in a flexible sign.

The step of applying the reflective flap 28 could be accomplished using other bonding methods, such as an adhesive-backed reflective flap which would be applied atop weld seam 34 of the substrate layers. However, while such an adhesive-backed reflective layer is within the scope of this invention, it has been found to be less preferable to use adhesives, because of air bubble problems, and a

reduction in reflective quality at the point of adhesion along the weld seam, which degrades the final appearance of the grand-format sign. It has been found that by using a pattern replicating die 32 to replicate the surface of the flexible bonded sheet at the point of the weld seam 34, that problems with adhesives are avoided and that 100% reflective quality and 100% structural integrity can be maintained across the surface of a grand format sign.

FIG. 8 illustrates the final product produced by the method heretofore described, showing the weld seam 34 with appropriate air pillow 20 and air pockets 22 located atop weld seam 34 as created by pattern replicating die 32.

The pattern replicating die 32 is shown in two embodiments in FIGS. 9 and 10. While the sealing bar 30 which seals the substrate layers is merely an iron with a planar surface, which is heated with RF waves, the pattern replicating die 32 incorporates a plurality of squarish cavities 36. The edges 38 of the cavities 36 contact the surface of the reflective material layer 16 and weld it to the substrate layers 18 creating the edges 40 of the air pillows, upon being heated through contact with the sealing bar. The cavities 36 create the air pocket 22 of the air pillow 20 by allowing the reflective material layer to advance upwards into cavity 36 without contacting the substrate layer 18 and welding to it. FIG. 9 represents a "throw-away" die 32 made of machined metal having cavities 36 and edges 38, as previously described. FIG. 10 represents a permanent die 32 having a non-conductive insert 42 mounted in the top of cavity 36 and a non-conductive cladding 44 surrounding the exterior of die 32. The non-conductive materials are preferably fiberglass, epoxy, or silicone rubber. The squarish edges 38 surrounding the cavity 36 remain an RF conductive material, such as metal.

The method of machine manufacturing sign material from the modified flexible bonded sheet shown in FIG. 3 allows a standard 10' X 48' billboard size material to be made in 10-20 minutes with an RF bar sealer and pattern replicating die. The hand application method described herein requires two personnel and four hours to complete.

The method of installation of the sign described herein takes advantage of its flexible nature. As part of the sign's manufacture it is preferred if corner pockets or grommets be installed for purposes of placing trucking straps so that the sign can be winched tight from several winching points upon installation. Upon being delivered to a billboard location for installation, a sign manufactured from the two methods disclosed herein can be unrolled, stretched around a billboard frame, and subsequently pulled taught, and hooked with four or more trucking straps. This method of installation can be accomplished using a crew of as few as four people for a typical 10' X 48' billboard sign, and can be completed in one-fifth the typical time it takes to install a billboard sign which used plywood, or other rigid material as a substrate. Therefore, added savings are presented by this invention in terms of labor costs and time saved in installation.

Accordingly, this invention provides for a sign material made from modified flexible bonded sheet, which can be used to machine-manufacture a material for making flexible grand format signs having superior properties not heretofore seen. This material can be shipped to a sign maker in a "blank" grand format size, at which point, the sign can be completed by printing various indicia upon the sign by digital printing, for example. Additionally, the invention provides for a method for machine manufacturing this blank material from the modified flexible bonded sheet previously described. In the alternative, this invention also provides for a method of making a flexible grand format sign using hand applied CCMR and a flexible substrate such as PVC nylon web.

This invention is also a flexible grand format sign made from flexible sign material which can be rolled up and shipped to a location for installation, unrolled, and installed.

Finally, although the description above contains many specificities, these should not be construed as limiting the scope of the invention but as merely providing illustrations of some of the presently preferred embodiments of this invention.

CLAIMS

I Claim:

1. A flexible grand format sign intending to be rolled up for transporting, comprising:

a flexible substrate layer and a flexible reflective layer, said reflective layer bonded to said substrate layer;

said reflective layer and said substrate layer sized in a grand format dimension; and

printed indicia placed upon said sign.

2. The grand format sign of claim 1, wherein said substrate layer is comprised of a vinyl and nylon web substrate.

3. The grand format sign of claim 2, wherein said reflective layer is cube corner microprism retroreflective film.

4. The grand format sign of claim 3, wherein said reflective layer is adhesively applied to said substrate layer.

5. The grand format sign of claim 1, further comprised of adjacent sections of flexible bonded sheet, said adjacent sections sharing a welded substrate layer, forming a weld seam, said weld seam bonded to a layer of reflective material formed into air pillows along said weld seam.

6. A modified flexible bonded sheet material for manufacturing grand format signs, said material comprising:

a section of flexible bonded sheet material;

a first edge bordering said bonded sheet material section, said first edge

comprised of a bare flexible substrate layer; and

a second edge bordering said bonded sheet material section, said second edge comprised of a flexible substrate layer overlaid by a flap of flexible reflective material.

7. A sign material for manufacturing grand format signs, comprising:

a first section of flexible bonded sheet material, said section including a bare substrate edge;

a second section of flexible bonded sheet material, said section including an edge having a substrate layer overlaid with a flap of reflective material;

said first and second sections of bonded sheet material welded together along said substrate layers forming a weld seam;

said flap of reflective material bonded to said welded seam to complete a junction between said first and second sections of bonded sheet material.

8. The material of claim 7, wherein said flap of reflective material is adhesively bonded to said weld seam.

9 The material of claim 7, wherein said flap of reflective material is bonded to said weld seam to form a plurality of air pillows along said weld seam.

10. The material of claim 7, wherein said first and second sections of bonded sheet material are wider than 48 inches along an edge perpendicular to said weld seam.

11. A method for manufacturing a material for creating grand format signs, comprising:

overlapping flexible substrate layers from two adjacent sections of flexible bonded sheet material;

welding said substrate layers together to form a weld seam;

overlaying said weld seam with a flap of flexible reflective material;

bonding said reflective material to said weld seam to form said reflective material into a surface which is identical in appearance to the surface of said adjacent sections of flexible bonded sheet material.

12. The method of claim 11, wherein said substrate layers are welded with a bar sealer using RF energy.

13. The method of claim 12 wherein said reflective material is formed into a pattern replicating die and bonded to said weld seam with RF energy, said pattern replicating die forming said reflective material into a plurality of air pillows along said weld seam.

14. The method of claim 11, wherein said sections of bonded sheet material are wider than 48 inches along an edge perpendicular to said weld seam.

AMENDED CLAIMS

[received by the International Bureau on 09 february 2000 (09.02.00);
original claims 1-14 replaced by amended claims 1-17 (4 pages)]

I Claim:

1. A flexible grand format sign intending to be rolled up for transporting, comprising:

a flexible substrate layer and a flexible reflective layer, said reflective layer bonded to said substrate layer;

said reflective layer and said substrate layer sized in a grand format dimension; and

printed indicia placed upon said sign so that said indicia are reflected by said reflective layer in a manner retaining uniform visual appearance across a visually appearing surface of said sign.

2. The grand format sign of claim 1, wherein said substrate layer is comprised of a vinyl and nylon web substrate.

3. The grand format sign of claim 2, wherein said reflective layer is cube corner microprism retroreflective film.

4. The grand format sign of claim 3, wherein said reflective layer is adhesively applied to said substrate layer.

5. The grand format sign of claim 1, further comprised of adjacent sections of flexible bonded sheet, said adjacent sections sharing a welded substrate layer, forming a weld seam, said weld seam bonded to a layer of reflective material formed into air pillows along said weld seam.

6. The grand format sign of claim 1, further comprising adjacent sections of flexible bonded sheet, said adjacent sections sharing a welded flexible substrate

layer forming a weld seam, said weld seam being adhesively bonded to a layer of reflective material positioned atop said weld seam.

7. A modified flexible bonded sheet material for manufacturing grand format signs, said material comprising:

a section of flexible bonded sheet material;

a first edge bordering said bonded sheet material section, said first edge comprised of a bare flexible substrate layer; and

a second edge bordering said bonded sheet material section, said second edge comprised of a flexible substrate layer overlaid by a flap of flexible reflective material.

8. A sign material for manufacturing grand format signs, comprising:

a first section of flexible bonded sheet material, said section including a bare substrate layer edge;

a second section of flexible bonded sheet material, said section including a substrate layer edge overlaid with a flap of reflective material;

said bare substrate layer edge from said first section being welded to said substrate layer edge from said second section, said welded substrate layer edges forming a weld seam;

said flap of reflective material being bonded to said weld seam to complete a junction between said first and second sections of bonded sheet material.

9. The material of claim 8, wherein said flap of reflective material is adhesively bonded to said weld seam.

10. The material of claim 8, wherein said flap of reflective material is bonded to said weld seam to form a plurality of air pillows along said weld seam.

11. The material of claim 8, wherein said first and second sections of bonded sheet material are wider than 48 inches along an edge perpendicular to said weld seam.

12. A method for manufacturing a material for creating grand format signs, comprising:

overlapping flexible substrate layers from two adjacent sections of flexible bonded sheet material;

welding said flexible substrate layers together to form a weld seam;

overlaying said weld seam with a flap of flexible reflective material;

bonding said reflective material to said weld seam to form said reflective material into a visually appearing surface which is uniform across said sign material.

13. The method of claim 12, wherein said flexible substrate layers are welded with a bar sealer using RF energy to form said weld seam.

14. The method of claim 12, wherein said adjacent sections of bonded sheet material are wider than 48 inches along an edge perpendicular to said weld seam.

15. The method of claim 12, further comprising bonding said reflective material to said weld seam by first forming said reflective material into a plurality of air pillows and secondly bonding said reflective material to said weld seam, said air pillows creating a visually appearing surface which is uniform across said sign material.

16. The method of claim 14, further comprising forming said reflective material into air pillows using a pattern replicating die and bonding said reflective material to said weld seam using RF energy.

17. A method of manufacturing a grand format sign, the method comprising:

a) supplying a flexible substrate layer having a grand format dimension;

b) supplying adjacent sections of flexible reflective material having indicia printed thereon;

c) adhesively applying said adjacent sections of flexible reflective material to said flexible substrate layer so that said indicia are aligned to form a completed sign message, said flexible substrate layer being covered by said flexible reflective layer.

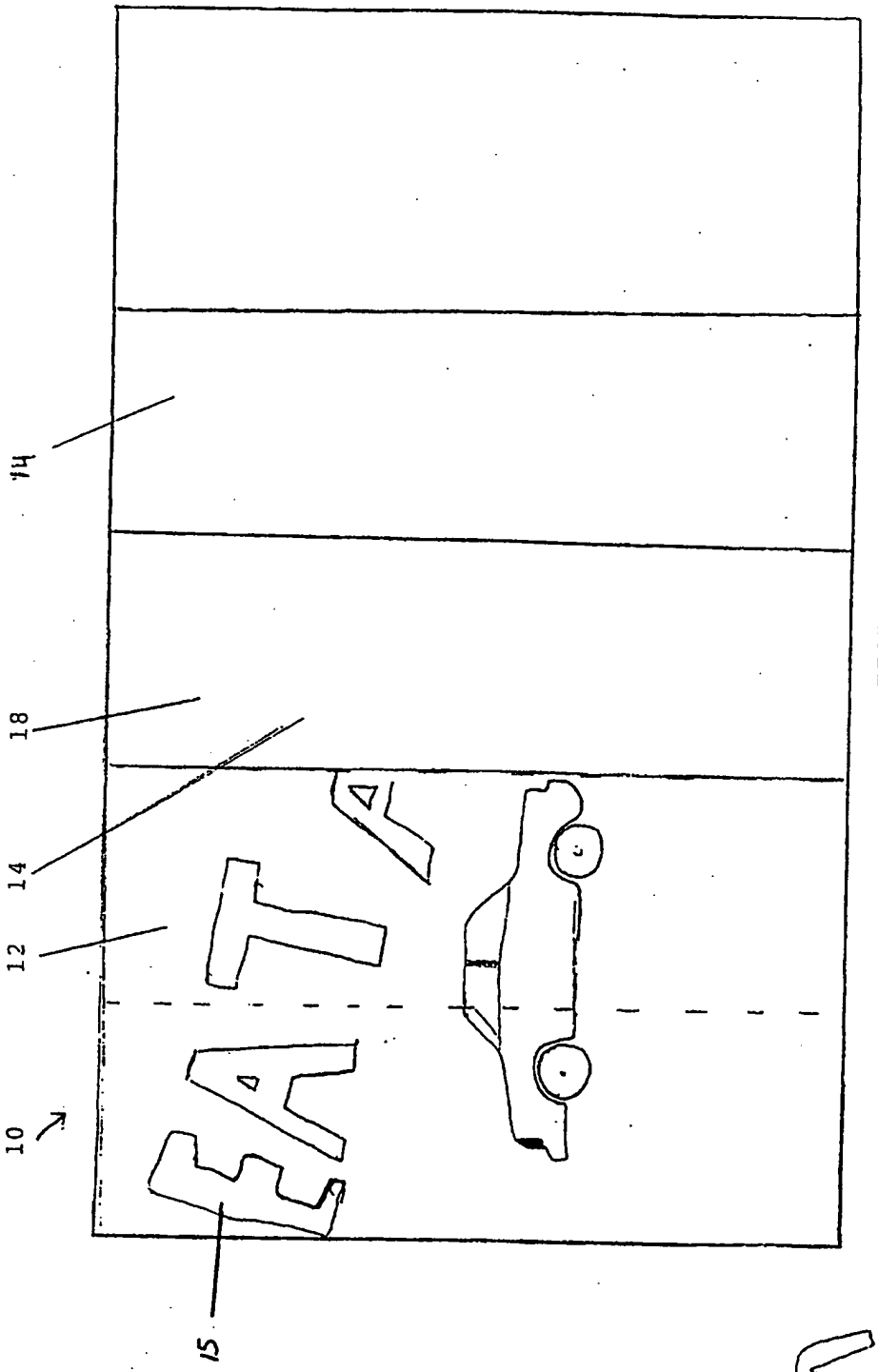

FIGURE 1

Sheet No. 21

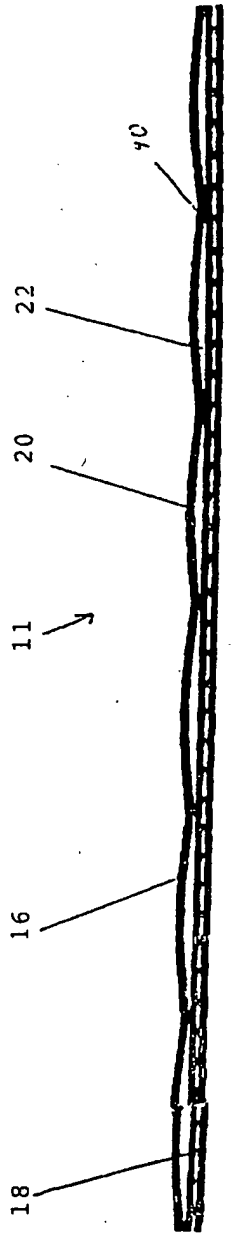

FIGURE 2

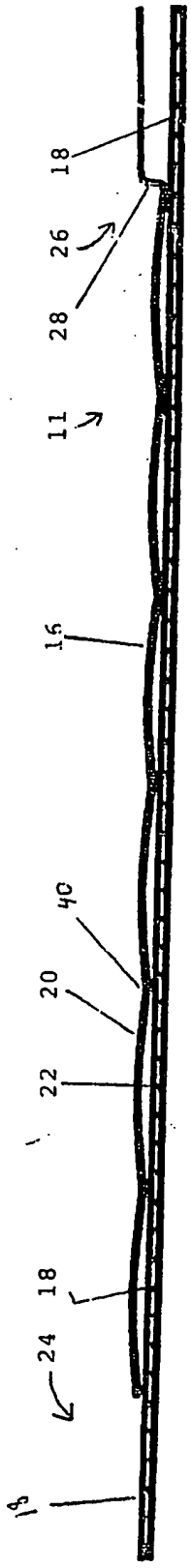

FIGURE 3

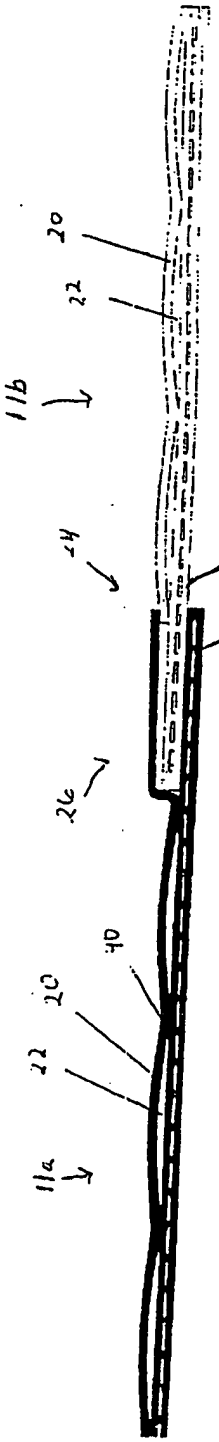

FIGURE 4

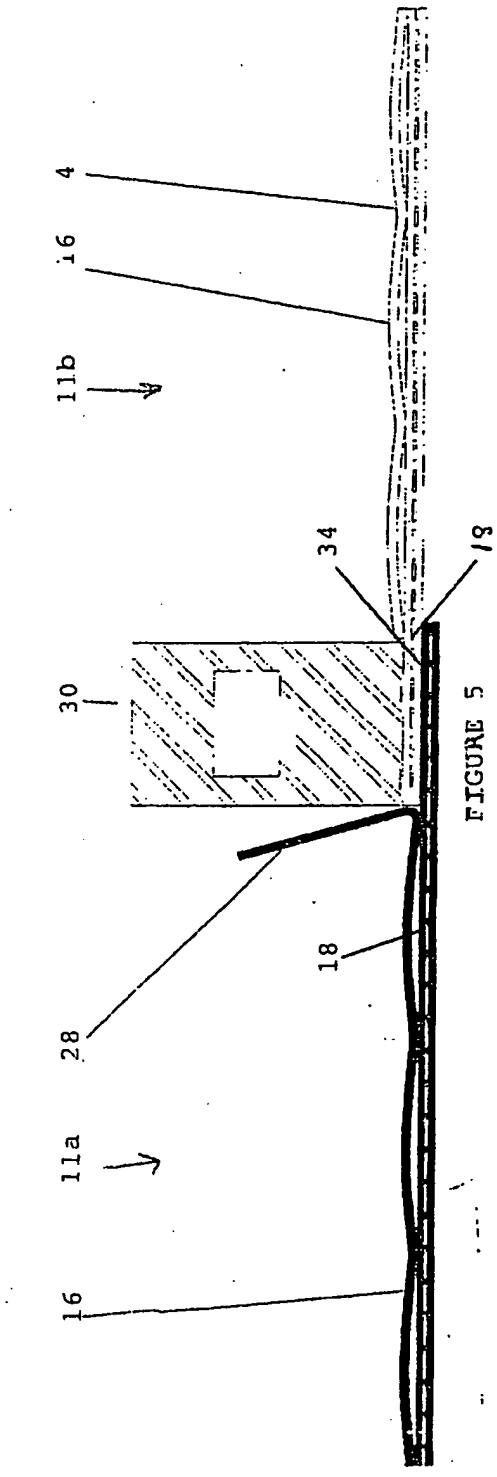

FIGURE 5

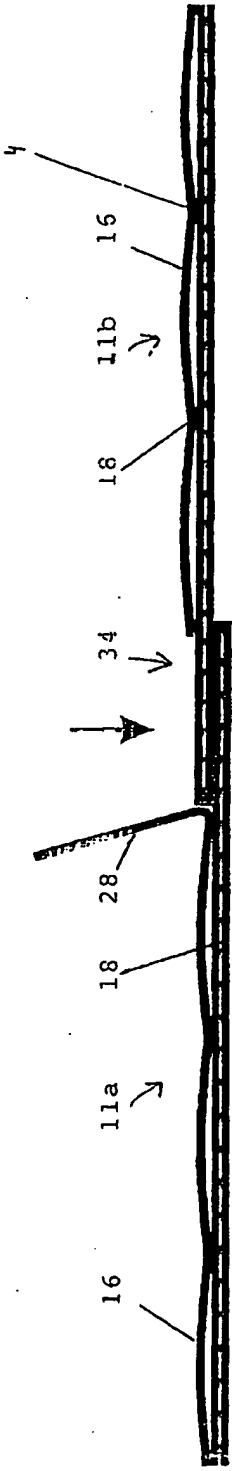

FIGURE 6

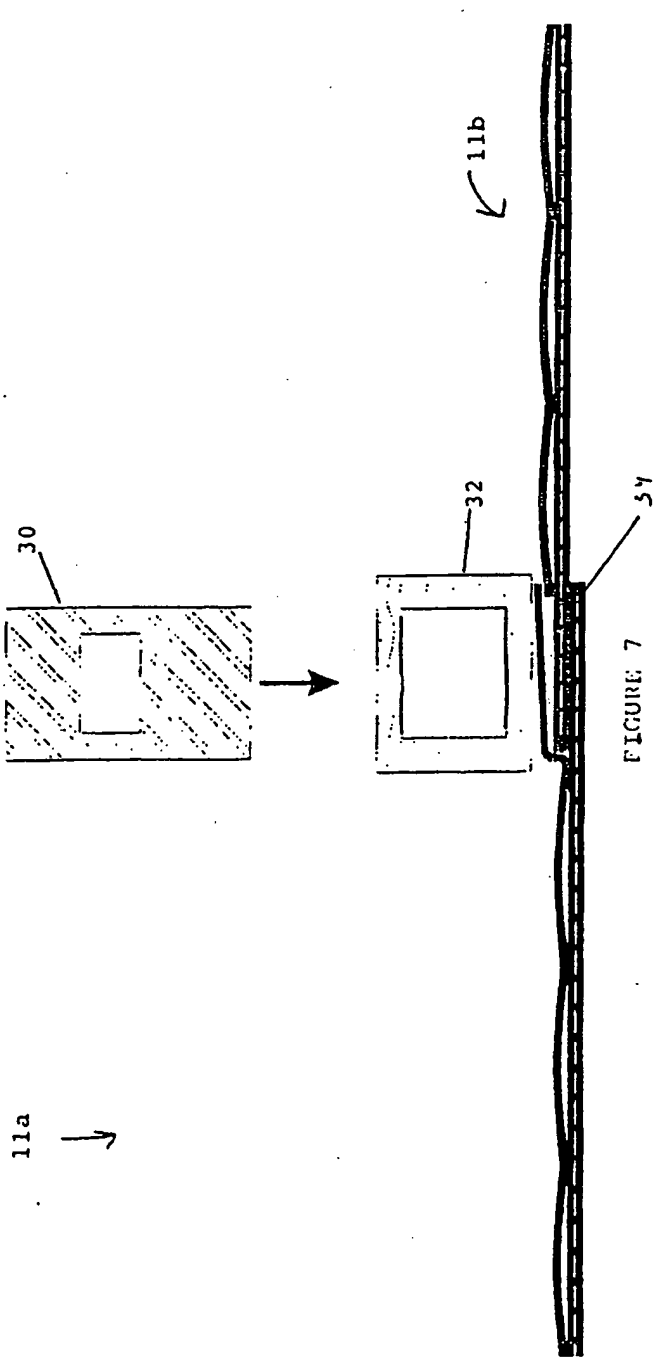

FIGURE 7

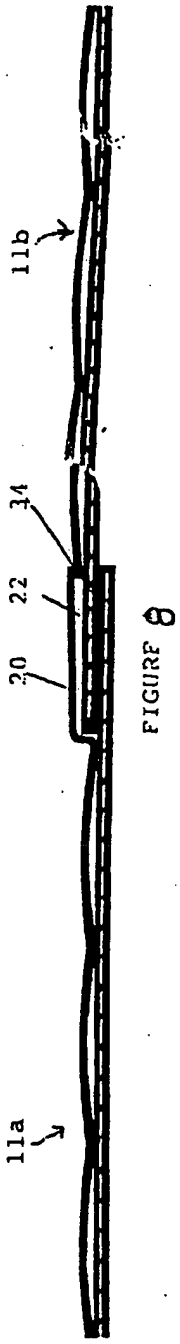

FIGURE 8

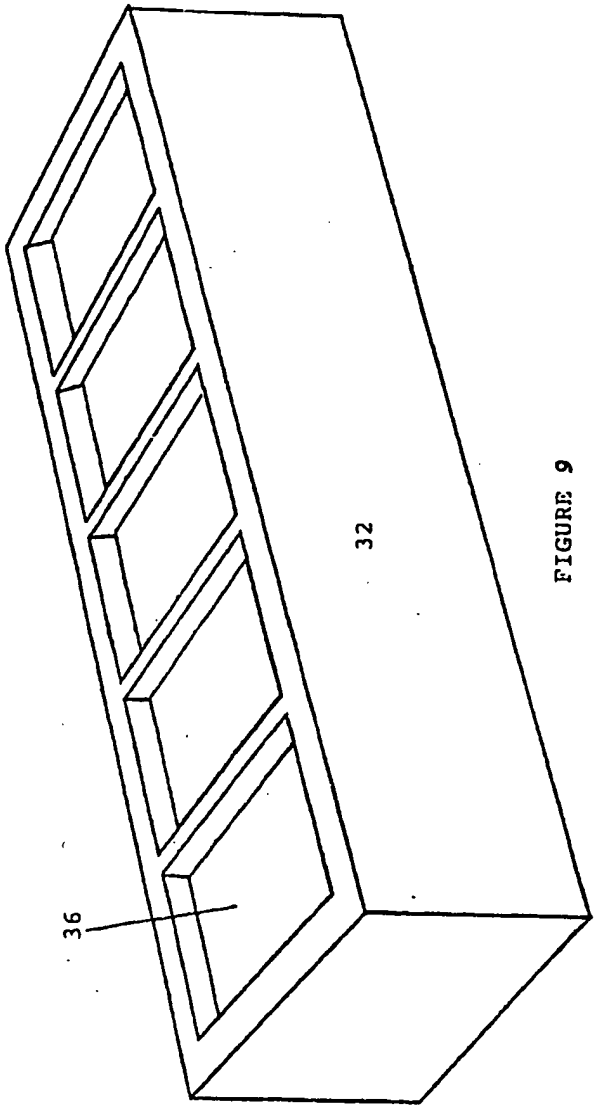

FIGURE 9

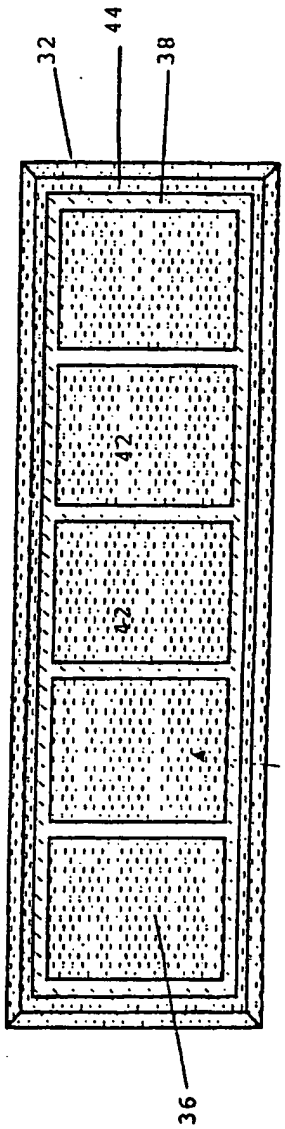

FIGURE 10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/20050

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :B32B 3/00; G09F 13/16
US CL :Please See Extra Sheet.
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 428/192,195,475.5,500; 40/582,583,612,615; 359/529; 156/60,73.5

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WEST

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- A	US 4,231,830 A (RYAN et al.) 04 November 1980, columns 3-4; figures 2-6.	1-4 ---- 5-14
X --- A	US 5,303,492 A (NISHIO) 19 April 1994, columns 3-4; figures 2,6 and 7.	1-4 ---- 5-14
X --- A	US 5,491,586 A (PHILLIPS) 13 February 1996, columns 3-4; figures 1,2A,2B and 2C.	1-4 ---- 5-14
X --- A	US 5,753,344 A (JACOBSEN) 19 May 1998, columns 3-5; figure 3.	1-4 ---- 5-14

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search	Date of mailing of the international search report
23 NOVEMBER 1999	10 DEC 1999
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer ARENA L. DYE Telephone No. (703) 308-2351

Form PCT/ISA/210 (second sheet)(July 1992)*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/20050

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- A	US 5,759,671 A (TANAKA et al.) 02 June 1998, columns 3-5; figures 1-5.	1-4 ---- 5-14

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/20050

A. CLASSIFICATION OF SUBJECT MATTER:
US CL :

428/192,195,475.5,500; 40/582,583,612,615; 359/529; 156/60,73.5